IN THE CLAIMS

The following is a complete listing of the claims. This listing replaces all earlier versions and listings of the claims.

Claim 1 (previously presented): A method of processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera projections, the method comprising processing respective subsets of the images in the sequence, each subset comprising a plurality of images, by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error,

wherein the respective subsets of images are selected sequentially from the sequence so that each image in the sequence is processed in a subset at least once.

Claim 2 (previously presented): A method of processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera projections, the method comprising processing respective subsets of the images in the sequence by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error, wherein the changed positions for the 3D feature points and the changed camera positions are calculated by reducing the calculated error by performing processing in accordance with a minimization procedure to change iteratively the positions of at least some of the selected 3D feature points and the camera projections of the images in the subset and to calculate an updated error by projecting the 3D feature points from their changed positions into the images in the subset using the changed camera projections of the images in the subset, and determining the distance

between the positions of the projected points and the positions of the corresponding features in the images,

wherein the respective subsets of images are selected sequentially from the sequence so that each image in the sequence is processed in a subset at least once.

Claim 3 (previously presented): A method according to claim 2, wherein the calculated error is reduced by performing processing in accordance with a non-linear least squares minimization procedure.

Claim 4 (previously presented): A method according to claim 3, wherein the calculated error is reduced by performing processing in accordance with a Levenberg-Marquardt minimization procedure.

Claim 5 (previously presented): A method of processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera projections, the method comprising processing respective subsets of the images in the sequence by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera

projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error, wherein the changed positions for the 3D feature points and the changed camera projections are calculated by decomposing a matrix representing the positions in the images in the subset of the features which correspond to the 3D feature points to be changed into the product of a first matrix representing the changed camera projections of the images in the subset and a second matrix representing the changed positions of the 3D feature points,

wherein the respective subsets of images are selected sequentially from the sequence so that each image in the sequence is processed in a subset at least once.

Claim 6 (original): A method according to claim 1, wherein the selected 3D feature points used to calculate an error comprise every 3D feature point which corresponds to a feature having a measured position in at least one of the images in the subset being processed.

Claim 7 (previously presented): A method of processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the

projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera projections, the method comprising processing respective subsets of the images in the sequence by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error, wherein the 3D feature points for which changed positions are calculated comprise every 3D feature point which has a measured position in at least one of the images in the subset being processed but no measured position in any of the other images in the sequence,

wherein the respective subsets of images are selected sequentially from the sequence so that each image in the sequence is processed in a subset at least once.

Claim 8 (original): A method according to claim 1, wherein each respective subset contains the same number of images.

Claim 9 (previously presented): A method of processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera projections, the method comprising processing respective subsets of the images in the sequence by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error,

wherein the respective subsets of images are selected sequentially from the sequence so that each image in the sequence is processed in a subset at least once and wherein the number of images in a subset is set in dependence upon the number of features in the images having a position defined in the data to be processed.

Claim 10 (previously presented): A method of processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera projections, the method comprising processing respective subsets of the images in the sequence by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error,

wherein the respective subsets of images are selected from the sequence with an overlap and such that each image in the sequence is processed in a subset at least once.

Claim 11 (original): A method according to claim 1, further comprising the step of generating a signal conveying the further estimates of the camera projections.

Claim 12 (original): A method according to claim 11, further comprising the step of recording the signal either directly or indirectly.

Claim 13 (original): A method according to claim 1, further comprising the step of processing image data defining the images in the sequence to generate the input data.

Claim 14 (original): A method according to claim 1, further comprising the step of using the further estimates of the camera projections to generate data defining a 3D computer model of the scene in the images.

Claim 15 (original): A method according to claim 14, further comprising the step of generating a signal conveying the 3D computer model.

Claim 16 (original): A method according to claim 15, further comprising the step of recording the signal either directly or indirectly.

Claim 17 (previously presented): An apparatus for processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera

projections, comprising a processor for processing respective subsets of the images in the sequence, each subset comprising a plurality of images, by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error,

wherein the processor is arranged to process respective subsets of images from the sequence sequentially such that each image in the sequence is processed in a subset at least once.

Claim 18 (currently amended): An apparatus for processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera projections, comprising a processor for processing respective subsets of the images in the sequence by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error, wherein the processor is arranged to calculate the changed positions for the 3D feature points and the changed camera positions by reducing the calculated error by performing processing in accordance with a ~~minimisation~~ minimization procedure to change iteratively the positions of at least some of the selected 3D feature points and the camera projections of the images in the subset and to calculate an updated error by projecting the 3D feature points from their changed positions into the images in the subset using the changed camera projections of the images in the subset, and determining the distance between the positions of the projected points and the positions of the corresponding features in the images,

wherein the processor is arranged to process respective subsets of images from the sequence sequentially such that each image in the sequence is processed in a subset at least once.

Claim 19 (currently amended): An apparatus according to claim 18, wherein the processor is arranged to reduce the calculated error by performing processing in accordance with a non-linear least squares ~~minimisation~~ minimization procedure.

Claim 20 (currently amended): An apparatus according to claim 19, wherein the processor is arranged to reduce the calculated error by performing processing in accordance with a Levenberg-Marquardt ~~minimisation~~ minimization procedure.

Claim 21 (previously presented): An apparatus for processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera projections, comprising a processor for processing respective subsets of the images in the sequence by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to

determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error, wherein the processor is arranged to calculate the changed positions for the 3D feature points and the changed camera projections by decomposing a matrix representing the positions in the images in the subset of the features which correspond to the 3D feature points to be changed into the product of a first matrix representing the changed camera projections of the images in the subset and a second matrix representing the changed positions of the 3D feature points,

wherein the processor is arranged to process respective subsets of images from the sequence sequentially such that each image in the sequence is processed in a subset at least once.

Claim 22 (previously presented): An apparatus according to claim 17, wherein the processor is arranged to perform processing so that the selected 3D feature points used to calculate an error comprise every 3D feature point which corresponds to a feature having a measured position in at least one of the images in the subset being processed.

Claim 23 (previously presented): An apparatus for processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera

projections, comprising a processor for processing respective subsets of the images in the sequence by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error, wherein the processor is arranged to perform processing so that the 3D feature points for which changed positions are calculated comprise every 3D feature point which has a measured position in at least one of the images in the subset being processed but no measured position in any of the other images in the sequence,

wherein the processor is arranged to process respective subsets of images from the sequence sequentially such that each image in the sequence is processed in a subset at least once.

Claim 24 (previously presented): An apparatus according to claim 17, wherein the processor is arranged to perform processing so that each respective subset contains the same number of images.

Claim 25 (previously presented): An apparatus for processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera projections, comprising a processor for processing respective subsets of the images in the sequence by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error,

wherein the processor is arranged to process respective subsets of images from the sequence sequentially such that each image in the sequence is processed in a subset at least once and wherein the processor is arranged to perform processing so that the number of images in a subset is set in dependence upon the number of features in the images having a position defined in the data to be processed.

Claim 26 (previously presented): An apparatus for processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera projections, comprising a processor for processing respective subsets of the images in the sequence by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error,

wherein the processor is arranged to perform processing so that the respective subsets of images are selected from the sequence with an overlap and such that each image in the sequence is processed in a subset at least once.

Claim 27 (previously presented): An apparatus according to claim 17, further comprising an input data generator for processing image data defining the images in the sequence to generate the input data.

Claim 28 (previously presented): An apparatus according to claim 17, further comprising a 3D computer model data generator for using the further estimates of the camera projections to generate data defining a 3D computer model of the scene in the images.

Claim 29 (original): A storage device storing instructions for causing a programmable processing apparatus to become operable to perform a method as set out in at least one of claims 1 to 16.

Claim 30 (currently amended): A ~~computer-readable memory medium storing~~ physically-embodied computer program product carrying computer program instructions for programming a programmable processing apparatus to become operable to perform a method as set out in any one of claims 1 to 16.

Claims 31-33 (cancelled)

Claim 34 (previously presented): An apparatus for processing input data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points

comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera projections, comprising processing means for processing respective subsets of the images in the sequence, each subset comprising a plurality of images, by:

calculating an error for the camera projections of the images in the subset by projecting selected 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset by using the positions in the images in the subset of the features which correspond to the selected 3D feature points to determine changed positions for at least some of the selected 3D feature points and changed camera projections for the images in the subset which reduce the calculated error,

wherein the processing means is arranged to process respective subsets of images from the sequence sequentially such that each image in the sequence is processed in a subset at least once.

Claims 35-65 (cancelled)

Claim 66 (previously presented): A method of processing data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising

estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera projections, the method comprising processing respective subsets of the images in the sequence, each subset comprising a plurality of images, by:

calculating an error for the camera projections of the images in the subset by projecting 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed 3D positions for at least some of the 3D feature points that were projected and changed camera projections for at least some of the images in the subset by using the positions in the images in the subset of the features which correspond to the 3D feature points that were projected to determine changed 3D positions for at least some of the 3D feature points that were projected and changed camera projections for at least some of the images in the subset which reduce the calculated error,

wherein the respective subsets of images are selected sequentially from the sequence so that each image in the sequence is processed in a subset at least once.

Claim 67 (previously presented): An apparatus for processing data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera

projections, comprising a processor operable to process respective subsets of the images in the sequence, each subset comprising a plurality of images, by:

calculating an error for the camera projections of the images in the subset by projecting 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed 3D positions for at least some of the 3D feature points that were projected and changed camera projections for at least some of the images in the subset by using the positions in the images in the subset of the features which correspond to the 3D feature points that were projected to determine changed 3D positions for at least some of the 3D feature points that were projected and changed camera projections for at least some of the images in the subset which reduce the calculated error,

wherein the processor is arranged to process respective subsets of images from the sequence sequentially such that each image in the sequence is processed in a subset at least once.

Claim 68 (previously presented): An apparatus for processing data defining (i) the positions of features in a sequence of images of at least one object which represent features on the object, (ii) an estimate of a respective camera projection for each image defining the projection of points on the object into the image, and (iii) 3D feature points comprising estimates of the positions in three-dimensions of features on the object represented by the features in the images, to generate output data defining further estimates of the camera

projections, comprising processing means for processing respective subsets of the images in the sequence, each subset comprising a plurality of images, by:

calculating an error for the camera projections of the images in the subset by projecting 3D feature points into the images in the subset using the camera projections of the images in the subset and determining the distance between the positions of the projected points and the positions of the corresponding features in the images; and

calculating changed 3D positions for at least some of the 3D feature points that were projected and changed camera projections for at least some of the images in the subset by using the positions in the images in the subset of the features which correspond to the 3D feature points that were projected to determine changed 3D positions for at least some of the 3D feature points that were projected and changed camera projections for at least some of the images in the subset which reduce the calculated error,

wherein the processing means is arranged to process respective subsets of images from the sequence sequentially such that each image in the sequence is processed in a subset at least once.

Claim 69 (previously presented): A storage device storing computer program instructions for programming a programmable processing apparatus to become operable to perform a method as set out in claim 66.

Claim 70 (currently amended): A ~~computer-readable memory medium storing~~ physically-embodied computer program product carrying computer program instructions for programming a programmable processing apparatus to become operable to perform a method as set out in claim 66.